Summary

The United States Fish and Wildlife Service's (USFWS) National Investigational New Animal Drug Office conducted a study to generate efficacy data needed to help obtain U.S. Food and Drug Administration approval for the use of AQUI-S® as a fish anesthetic. The study (AQUIS-01-SUPP-EFF-05) was conducted September 18, 2003, at Kent SeaTech Corporation Fish Production Facility, Mecca, CA, under Study Protocol Number AQUIS-01-SUPP-EFF and in accordance with Good Clinical Practice standards. All data generated were audited internally to ensure completeness.

The data collected during Study AQUIS-01-SUPP-EFF-05 consisted of three separate experiments. In each experiment, three AQUI-S® "treatments" (i.e., 40, 60, and 80 mg/L) were used to induce anesthesia to the handleable stage in (1) adult hybrid striped bass (HSB) *Morone chrysops x M. saxatilis* (Experiment 1), (2) in adult Tilapia *Oreochromis mossambica* (Experiment 2), and (3) in adult hybrid carp / goldfish (Carp) *Cyprinus carpio* x *Carassius auratus* (Experiment 3). All experiments were conducted at a mean water temperature of about 26^{o}C. In each experiment, test fish were exposed individually to the handleable stage of anesthesia at each AQUI-S® concentration. Test fish that became handleable within 60 min were tested to determine whether they recovered from handleable within 30 min.

The AQUI-S® treatments were each administered to ten individual fish tested separately. Consequently, a total of 30 HSB, 30 Tilapia, and 30 Carp were used in the

study. Fish were tested to handleable stage (60-min maximum-time limit allowed), and data collected included (1) time (min:sec) to handleable for individual fish, (2) total length of individual fish, (3) general behavior of individual fish, and (4) water temperature (0.1^{o}C) and dissolved oxygen concentration (0.1 mg/L) of the anesthetic working solution. Data collected during recovery from anesthesia (30-min maximum-time limit allowed) included (1) time (min:sec) for individual fish to recover from handleable, (2) general behavior of individual fish, and (3) survival of individual fish.

In Experiment 1, general behavior for all HSB (median length = 28.3 cm) were characterized as normal. No test fish died during the experiment. All fish tested at 40, 60, or 80 mg/L AQUI-S® became handleable and recovered from handleable within the 60- and 30-min time limits. Median times for test fish to become handleable when exposed to 40, 60, or 80 mg/L AQUI-S® were 3.5, 2.6, and 2.1 min, respectively. Median times for test fish to recover from handleable for the three anesthetic groups were 2.3, 2.5, and 2.3 min, respectively.

In Experiment 2, general behavior of all Tilapia (median length= 24.0 cm) were characterized as normal. No test fish died during the experiment. All fish tested at 40, 60, or 80 mg/L AQUI-S® became handleable and recovered from handleable within the 60- and 30-min time limits. Median times for test fish to become handleable when exposed to 40, 60, or 80 mg/L AQUI-S® were 3.7, 4.6, and 4.5 min, respectively. Median times for test fish to recover from handleable for the three anesthetic groups were 1.9, 1.3, and 1.8 min, respectively.

In Experiment 3, general behavior of all Carp (median length = 30.0 cm) were characterized as normal. No test fish died during the experiment. All fish tested at 40, 60, or 80 mg/L AQUI-S® became handleable and recovered from handleable within the 60- and 30-min time limits. Median times for test fish to become handleable when exposed to 40, 60, or 80 mg/L AQUI-S® were 3.9, 3.3, and 2.1 min, respectively. Median times for test fish to recover from handleable for the three anesthetic groups were 2.3, 3.6, and 2.5 min, respectively.

Overall, the data generated during the study supported the following conclusion:

AQUI-S® concentrations of 40, 60, and 80 mg/L are efficacious and safe for inducing adult HSB, Tilapia, and Carp to the handleable stage of anesthesia; and for test fish to recover from the handleable stage. Such a use of AQUI-S® will likely be acceptable to most fish culturists and fisheries management biologists because (a) times to handleable and recovery from handleable meet or are reasonably close to the characteristics of a preferred “ideal” fish anesthetic and because (b) abnormal behavior and mortality are unlikely to occur.

Table 7. Median times to handleable (HT) and recovery from handleable (HRT) for adult HSB, Tilapia, and Carp exposed to AQUI-S® at a water temperature of 26°C.[a]

Species / Experiment	Number of fish exposed	AQUI-S® Concentration (mg/L)[a]	HT (min)	HRT (min)
HSB Experiment 1	10	40	3.35	2.17
	10	60	2.58	2.35
	10	80	2.03	2.17
Tilapia Experiment 2	10	40	3.30	1.75
	10	60	4.35	1.22
	10	80	4.20	1.82
Carp / Goldfish Experiment 3	10	40	3.83	2.17
	10	60	3.28	3.42
	10	80	2.02	1.73

[a] Individual times for test fish are listed on raw data forms in Appendix D.